

The RealityGrid Steering Portal

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Background

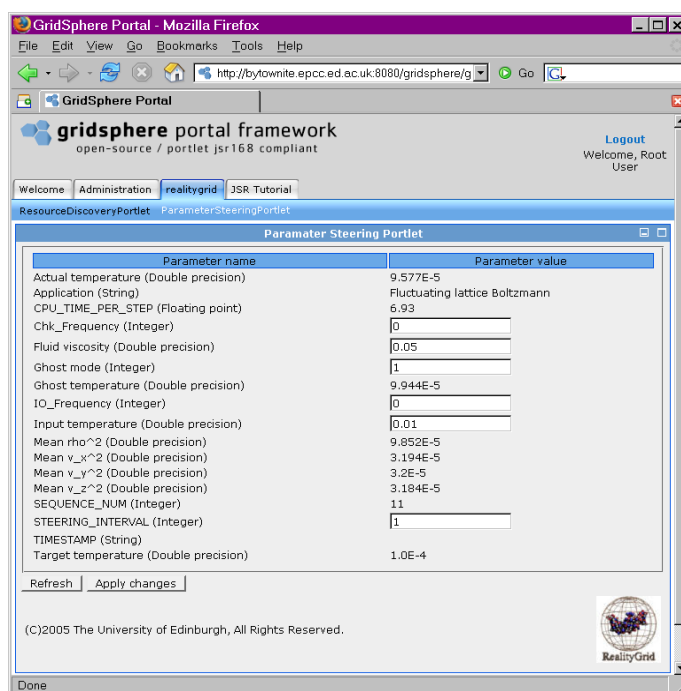
The RealityGrid Steering Portal is one component of the larger RealityGrid project [1], which provides a grid-enabled environment for computational steering. The principal motivation for RealityGrid users is the study of complex materials, which may involve multi-component fluids, colloidal particles, surfactants, and/or large biological molecules. The study of such systems requires the use of powerful computational techniques such as the lattice Boltzmann method, molecular dynamics, or coupled models involving combinations of these methods to capture physics at different scales.

Computational steering allows a scientist to interact with a simulation as it develops. This is an extremely powerful tool which can be used for activities such as parameter space searches which would otherwise be overwhelmingly tedious. For example, steering has been used to help to guide a lattice Boltzmann simulation of a sheared binary mixture to steady state, which is a complex function of the fluid viscosity, shear rate, and thermodynamic parameters.

To allow the scientist to interact with such simulations, RealityGrid has developed a generic Application Program Interface (API) that exposes steering functionality from within a simulation. This standardisation allows steering clients to be developed rapidly and effectively. A number of different clients have been developed as part of RealityGrid for use on different platforms.

The Web Steering Portal

The RealityGrid Steering Portal is a client that interfaces to the RealityGrid API, providing the user with access to the remote simulation, allowing it to be monitored and steered. The RealityGrid Steering Portal uses portlet technology to produce a lightweight client that runs in a web browser.



The RealityGrid web steering portal.

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This delivers control of the simulation to the user's desktop computer without the need for special software or complex local configuration of their environment.

To achieve maximum portability and longevity, RealityGrid Steering Portal is designed to comply with Java Community Process [2] JSR 168 Portlet Specification and is developed using the open source GridSphere [3] container and development environment. GridSphere is ideally suited to the aggregation of content from remote grid resources, providing the developer with access to generic portlets that provide core functionalities such as Single Sign On, content syndication, and user administration. These advantages are conveyed to the end user through as a collection of tailored web pages which adhere to a common look and feel, while allowing the user to customise the client to their individual preferences.

Within the RealityGrid Steering Portal, a collection of portlets are available that demonstrate the steering functionalities of the RealityGrid API. Three categories of functionality are provided:

- *Resource discovery* – management controls that allow the user to quickly locate their remote simulation, connect to it, and begin to interact.
- *Application control and check-pointing* – navigation controls that allow the user to affect the evolution of the simulation – for example:
 - pause/resume or stop the live simulation,
 - create, inspect and navigate between computation checkpoints.
- *Parameter monitoring/steering* – content that presents a full status history of the simulation using a mixture of tables, charts, and images, plus controls that allow the user to modify key physical parameters steering the model in real time.

Future work

The modular nature of the portlet approach should allow future developers and users of the Portal to extend functionality in an efficient manner. A number of features which might be useful include: access to lightweight thumbnail visualisation within the portal or links to more heavyweight visualisation run separately, job definition and submission, and data management. Eventually, the aim would be to provide a web-based portal to complex simulation code which could be used by non-expert users for all stages of their work. One limitation of the web portal approach is its inherently static action/response model which makes the inclusion of dynamic content difficult. However, the ease and simplicity of the browser-based portal approach are highly attractive.

References

- [1] RealityGrid Project, Webpage: <http://www.realitygrid.org/> (2005).
- [2] Java Community Process, <http://www.jcp.org/> (2004).
- [3] GridLab, *The GridSphere Portal Framework*, Webpage: <http://www.gridisphere.org/> (2005).